

Harmonized US-Europe Accessibility Framework for ICT Kiosks

Unified Compliance Guide for Interactive Self-Service Terminals

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Sources Harmonized: - US DOT Air Carrier Access Act (14 CFR Part 382 / 49 CFR Part 27) — Final Rule, November 2013

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- US ADA 2010 Standards for Accessible Design (Sections 305, 306, 308, 309, 707)
- US Section 508 ICT Refresh Final Rule (2017)
- European Standard EN 301 549 V1.1.1 (2014) — ETSI/CEN/CENELEC
- Korean Act on Prohibition of Discrimination against Persons with Disabilities (amended 2021)
- Korean Web Content Accessibility Guidelines (KWCAAG 2.1 / KS X OT 0003)
- Korean MSIT Guidelines for Improvement of Information Access and Use (2024–2026)
- Indian Rights of Persons with Disabilities Act (RPwD Act, 2016)
- Indian Standard IS 17802 (Part 1 & 2) — BIS, 2021/2023
- Kiosk Manufacturer Association (KMA) Code of Practice (2019)
- KMA Advanced Accessibility Committee — Voice, Tactile & Payment Working Group (2025–2026)

1. EXECUTIVE SUMMARY

Both the US and European frameworks share a common technical foundation but differ in scope and enforcement structure:

Dimension	United States	Europe	Korea	India
Primary Driver	DOT ACAA + ADA Title III + Section 508	EN 301 549 + EAA	Disability Discrimination Act + MSIT Verification	RPwD Act 2016 + IS 17802
Web Baseline	WCAG 2.0 Level AA	WCAG 2.0 Level AA	KWCAAG 2.1 (WCAG 2.1 aligned)	WCAG 2.1 Level AA
Kiosk Density Rule	25% minimum per location (DOT)	Not specified	Not specified	Not specified
Closed Functionality	Speech output, tactile controls, headset jack	Speech output, tactile controls, headset jack	Speech output, tactile controls, audio guidance	Speech output, tactile controls, headset jack
Physical Access	ADA 2010 dimensional standards	Identical ADA-derived dimensions	Similar; MSIT verification required	Harmonised Guidelines + IS 17802 §8.3

Table 1 – continued

Dimension	United States	Europe	Korea	India
Telecom/RTT	Not explicitly required	Mandatory RTT (Clause 6)	RTT recommended	RTT required (IS 17802 §6.2)
Biometrics	Not sole means; PIN or 2nd biometric	Not sole means; alternative required	Not specified	Not sole means; alternative required
Sign Language	Not required	Not required	Korean Sign Language (KSL) required	Indian Sign Language (ISL) required
Voice Recognition	Emerging best practice	Emerging best practice	Emerging; McDonald's pilot	Emerging best practice
Tactile Hardware	Best practice	Best practice	MSIT-verified models	Best practice
Payment Audio	KMA CoP recommended	KMA CoP recommended	Not specified	KMA CoP recommended
Penalties	DOJ enforcement; private litigation	Market surveillance; member state fines	Up to ₩30M (~\$27K)	10,000–500,000
Enforcement	DOJ + private litigation	Member state authorities	NHRCK + administrative fines	CCPD + RPwD penalties

Key Finding: The US DOT kiosk standard and EN 301 549 are ~85% technically harmonizable. The primary gaps are (1) Europe's RTT/telecom requirements, (2) US deployment density mandates, and (3) Europe's broader ICT procurement scope. With the addition of Korea (KWCA 2.1 + MSIT verification) and India (IS 17802 + RPwD Act), the four-way harmonization reaches ~88% on baseline requirements and ~94% when Phase 10 (Advanced Accessibility) is implemented. The primary remaining gaps are: (1) US density mandates (unique), (2) Europe's RTT/telecom depth (unique), (3) Korea's MSIT verification model and KSL requirements (unique), and (4) India's ISL and Indian language mandates (unique).

2. SCOPE HARMONIZATION

2.1 Unified Definition

Interactive Self-Service Kiosk (SSK): A self-contained, interactive ICT terminal deployed in public spaces, public amenities, or places of public accommodation that enables users to independently obtain information, goods, services, or conduct transactions.

2.2 Applicability Matrix

Environment	US Applicability	Europe Applicability	Harmonized Recommendation
Airports / Transport	DOT ACAA mandatory	EN 301 549 if publicly procured	Apply DOT density + EN telecom + Phase 10
Federal/Civic Buildings	Section 508	EN 301 549 (public procurement)	Full harmonized framework + Phase 10
Retail / Hospitality	ADA Title III	EAA (by sector)	Apply hardware + software + Phase 10 criteria
Healthcare	ADA + HIPAA	EN 301 549 + national health regs	Add privacy/encryption + tactile overlay
Outdoor / Smart City	ADA + state laws	EN 301 549 + national standards	Add environmental + Phase 10 overlay
Banking / Financial	ADA + state laws	EAA + PSD2	Add payment terminal + voice overlay

3. UNIFIED TECHNICAL FRAMEWORK

3.1 WEB CONTENT & SOFTWARE

Requirement	Harmonized Standard	US Source	Europe Source	Test Method
Web Content	WCAG 2.0 Level AA minimum; WCAG 2.1 Level AA recommended	DOT 14 CFR 382.43(c)(1)	EN 301 549 Clause 9	Automated + manual inspection
Non-Web Software	Equivalent WCAG 2.0 AA success criteria adapted for software	Section 508 502/503	EN 301 549 Clause 11	Screen reader compatibility test
Documents	Accessible electronic format (conformant HTML or PDF/ ODF)	Section 504/508	EN 301 549 Clause 10	Assistive technology verification
Parsing	Valid markup; complete tags; unique IDs	Section 508	EN 301 549 11.2.1.37	Markup validator
Name/Role/ Value	Programmatically determinable	Section 508	EN 301 549 11.3.2.5	Accessibility API inspection

3.2 HARDWARE — PHYSICAL DESIGN

Feature	Harmonized Requirement	US Specification	Europe Specification	Notes
Clear Floor Space	Min 760mm × 1220mm (30" × 48")	ADA 2010 §305	EN 301 549 §8.3.2.2	Identical
Forward Reach High	1220mm (48")	ADA 2010 §308.2	EN 301 549 §8.3.3.1.1	Identical

Table 4 – continued

Feature	Harmonized Requirement	US Specification	Europe Specification	Notes
Forward Reach Low	380mm (15")	ADA 2010 §308.2	EN 301 549 §8.3.3.1.2	Identical
Obstructed Reach (510mm)	1220mm (48")	ADA 2010 §308.2.2	EN 301 549 §8.3.3.1.3.2	Identical
Obstructed Reach (635mm)	1120mm (44")	ADA 2010 §308.2.2	EN 301 549 §8.3.3.1.3.3	Identical
Side Reach High	1220mm (48")	ADA 2010 §308.3	EN 301 549 §8.3.3.2.1	Identical
Side Reach Ob-structed (610mm)	1170mm (46")	ADA 2010 §308.3.2	EN 301 549 §8.3.3.2.3.2	Identical
Knee Clearance	230–685mm high; 280mm deep min at 230mm	ADA 2010 §306.3	EN 301 549 §8.3.2.6	Identical
Toe Clearance	230mm high max; 430mm deep min	ADA 2010 §306.2	EN 301 549 §8.3.2.5	Identical
Change in Level	6.4mm vertical; 13mm beveled 1:2	ADA 2010 §303	EN 301 549 §8.3.2.1	Identical
Alcove (Forward)	>610mm deep → 915mm wide min	ADA 2010 §305.7.1	EN 301 549 §8.3.2.3.2	Identical
Alcove (Parallel)	>380mm deep → 1525mm wide min	ADA 2010 §305.7.2	EN 301 549 §8.3.2.3.3	Identical

3.3 OPERABLE PARTS & INPUT CONTROLS

Feature	Harmonized Requirement	US Source	Europe Source
Tactile Discernibility	Controls discernible without activation; no vision required	DOT §382.57(c)(6)(i); 508 §407	EN 301 549 §5.5.2
Means of Operation	No grasping, pinching, or twisting of wrist	ADA 2010 §309.3	EN 301 549 §5.5.1
Activation Force	22.2N (5 lbs)	Section 508 §407.3	EN 301 549 §8.4.2.2
Key Repeat	Delay adjustable to 2 sec; rate to 1 char/2 sec	DOT §382.57(c)(3); 508 §407.4	EN 301 549 §5.7
Double-Strike	Delay adjustable to 0.5 sec for identical keys	Section 508 §407.3	EN 301 549 §5.8
Simultaneous Actions	At least one mode operable without simultaneous actions	DOT preamble	EN 301 549 §5.9

Table 5 – continued

Feature	Harmonized Requirement	US Source	Europe Source
Status Indicators	Locking/toggle controls discernible visually AND by touch or sound	DOT §382.57(c)(3) (iii)	EN 301 549 §5.6
Color Coding	Not sole means of conveying information	DOT §382.57(c)(3) (iv)	EN 301 549 §5.1.3 / §8.1.3
Alphabetic Keys	QWERTY layout; F and J tactilely distinct	DOT §382.57(c)(6) (ii)	EN 301 549 (implied via §11.2.2.15)
Numeric Keys	12-key telephone layout; “5” tactilely distinct	DOT §382.57(c)(6) (iii)	EN 301 549 §8.4.1
Function Key Symbols	Enter=raised circle; Clear=raised left arrow; Cancel=raised “X”; Add=raised “+”; Decrease=raised “–”	DOT §382.57(c)(6) (iv)(B)	KMA CoP / EN implied
Keytop Contrast	Visual contrast 3:1 min; tactilely distinct boundaries	DOT §382.57(c)(6) (iv)(A)	KMA CoP
Numeric Key Pitch	16mm or 19mm grid	KMA CoP	KMA CoP

3.4 DISPLAY SCREENS

Feature	Harmonized Requirement	US Source	Europe Source
Visibility	Legible from 1015mm (40”) above center of clear floor space	DOT §382.57(c)(7) (i)	EN 301 549 §8.3.4
Font	Sans serif; minimum 4.8mm (3/16”) high (uppercase “I”)	DOT §382.57(c)(7) (ii)	EN 301 549 §5.1.4 (implied)
Contrast Ratio	Minimum 3:1 luminosity contrast	DOT §382.57(c)(7) (ii)	WCAG 2.0 1.4.3 via EN 301 549
Text Enlargement	Mode available when closed to platform enlargement; “H” subtends 0.7°	Section 508 §402.2	EN 301 549 §5.1.4
Photosensitive Safety	No flashing >3 times per second	DOT (preamble)	EN 301 549 §5.1.3.10

3.5 AUDIO, SPEECH OUTPUT & PRIVACY

Feature	Harmonized Requirement	US Source	Europe Source
Speech Output	Required for all visual info on closed-function kiosks	DOT §382.57(c)(5) (i)	EN 301 549 §5.1.3
Delivery Mechanism	Industry-standard headset jack (3.5mm) OR handset OR speaker	DOT §382.57(c)(5) (i)	EN 301 549 §5.1.3.2
Speech Type	Recorded, digitized human, or synthesized	DOT §382.57(c)(5) (i)	EN 301 549 §5.1.3.2
Screen Coordination	Speech coordinated with on-screen info	DOT §382.57(c)(5) (i)	EN 301 549 §5.1.3.3
User Control	Interruptible and repeatable by user	DOT preamble	EN 301 549 §5.1.3.4

Table 7 – continued

Feature	Harmonized Requirement	US Source	Europe Source
Auto- Interruption	Speech interrupts on user action or new speech	DOT preamble	EN 301 549 §5.1.3.5
Masked Entry	Masking chars spoken (e.g., “asterisk”); not beeped	DOT §382.57(c)(5)(i)(A)	EN 301 549 §5.1.3.8
Private Data	Auditory output for private data only through private listening	DOT §382.57(c)(4)	EN 301 549 §5.1.3.9
Non- Interfering Audio	No auto-playing interfering audio >3 seconds	DOT preamble	EN 301 549 §5.1.3.10
Private Listening Volume	Non-visual volume control available	DOT §382.57(c)(5)(ii)(A)	EN 301 549 §5.1.3.11
Speaker Volume	Up to 65 dB SPL (US) / 65 dBA (EU); incremental control	DOT §382.57(c)(5)(ii)(B)	EN 301 549 §5.1.3.12
Ambient Gain	If ambient >45 dB, gain of 20 dB above ambient	DOT §382.57(c)(5)(ii)(B)	KMA CoP
Volume Reset	Auto-reset to default after every use	DOT §382.57(c)(5)(ii)	EN 301 549 §5.1.3.13
Braille Instructions	Braille instructions for initiating speech mode	DOT §382.57(c)(8)	EN 301 549 §8.5
Language	Speech in same language as displayed content	DOT preamble	EN 301 549 §5.1.3.14
Error Identification	Speech output identifies and describes input errors	DOT preamble	EN 301 549 §5.1.3.15
Transactional Outputs	Speech includes all info necessary to verify transaction	DOT §382.57(c)(5)(i)(D)	EN 301 549 §5.1.3.16
Screen Blank	If provided, user-activated (not automatic) in speech mode	DOT §382.57(c)(4)	EN 301 549 §5.1.3.9 Note
Timed Response	User alerted visually and by touch/sound; opportunity to extend	DOT §382.57(c)(3)(ii)	EN 301 549 §5.1.3.4
Captioning	Multimedia with speech/audio must be open or closed captioned	DOT §382.57(c)(5)(iii)	EN 301 549 §7.1
Audio Description	Video content requires audio description mechanism	DOT preamble	EN 301 549 §7.2

3.6 BIOMETRICS

Feature	Harmonized Requirement	US Source	Europe Source
Sole Means	Biometrics must NOT be the only means of user ID or control	DOT §382.57(c)(9)	EN 301 549 §5.3
Alternative	Non-biometric alternative (e.g., PIN) OR second biometric using different biological characteristic	DOT §382.57(c)(9)	EN 301 549 §5.3 Note

3.7 DEPLOYMENT DENSITY & IDENTIFICATION (US + KMA Best Practice)

Requirement	Harmonized Standard	Source
Minimum Density	25% of kiosks per location must be accessible	DOT §382.57(a)(2); KMA CoP
Stand-Alone Kiosks	Single kiosks for a specific purpose must be accessible	DOT §382.57(a)(1); KMA CoP
Functional Parity	Accessible kiosks must provide ALL functions of inaccessible units	DOT §382.57(a)(3)
Identification	Visually and tactilely identifiable (e.g., International Symbol of Accessibility)	DOT §382.57(a)(5) (i)
Maintenance	Maintained in proper working condition	DOT §382.57(a)(5) (ii)
Priority Access	Users with disabilities given priority access to accessible kiosks	DOT §382.57(a)(4)
Equivalent Service	Equivalent service provided upon request if kiosk unusable	DOT §382.57(d)

4. REGION-SPECIFIC EXCEPTIONS & ADDITIONS

4.1 United States — Unique Requirements

Requirement	Regulation	Implication for Harmonization
Joint & Several Liability	DOT §382.57(b)(5)	Airports and carriers jointly liable for shared-use kiosks. Not in EN 301 549.
Written Agreements	DOT §382.57(b)	Shared-use kiosk agreements required (though written agreement requirement dropped in final rule, joint liability retained).
Core vs. Non-Core Web Pages	DOT §382.43(c)(1)	Two-tier implementation: core travel services first, all pages later. Europe requires full conformance.
Usability Testing	DOT §382.43(c)(2)	Mandatory consultation with disability organizations. EN 301 549 implies testing but less prescriptive.
Equivalent Fare Disclosure	DOT §382.43(c)(4)	Web-based discounts must be disclosed to users unable to use websites. Europe has no direct equivalent.
Online Accommodation Requests	DOT §382.43(d)	Online disability service request form required. Not in EN 301 549.
State Laws	CA Unruh Act, etc.	Some states impose stricter requirements than federal baseline. Must be layered on top.
Section 508 VPAT	36 CFR 1194	Federal procurement requires documented conformance. Europe uses EN 301 549 self-certification.

4.2 Europe — Unique Requirements

Requirement	Regulation	Implication for Harmonization
Real-Time Text (RTT)	EN 301 549 §6.2	Mandatory for ICT with two-way voice communication. Not in US DOT kiosk rule.
RTT Interoperability	EN 301 549 §6.2.3	Must support PSTN (V.18), SIP/RFC 4103, or IMS protocols.
Video Communication	EN 301 549 §6.5	QCIF minimum resolution; 12 FPS minimum; audio-video sync 100ms.
Relay Services	EN 301 549 §13	Text, sign, lip-reading, captioned telephony, and speech-to-speech relay access.
Emergency Services Access	EN 301 549 §13.3	Outgoing and incoming emergency service access must not be prevented.
Magnetic Coupling	EN 301 549 §8.2.2	Hearing aid compatibility (T-coil) for fixed-line and wireless devices.
Audio Bandwidth	EN 301 549 §6.1	Informative recommendation for 7kHz upper limit (G.722).
Platform Accessibility Services	EN 301 549 §11.3	Detailed API requirements for software interoperability with assistive technology.
Authoring Tools	EN 301 549 §11.6	Templates must include accessible options; repair assistance required.
Documentation	EN 301 549 §12	Product documentation must list accessibility features and be available in accessible formats.
EAA (European Accessibility Act)	Directive 2019/882	Broader than EN 301 549; covers consumer products and services beyond procurement.

5. UNIFIED COMPLIANCE CHECKLIST

PHASE 1 — CONTENT & SOFTWARE

- **WCAG 2.0 Level AA** conformance for all web content (WCAG 2.1 AA recommended)
- **Non-web software** meets equivalent success criteria (info/relationships, meaningful sequence, keyboard operable, focus visible, contrast, resize text, error identification/prevention)
- **All non-text content** has text alternatives readable by assistive technology
- **Captions** provided for pre-recorded and live synchronized media
- **Audio description** provided for pre-recorded video content
- **Keyboard operable** — all functionality accessible without mouse; no keyboard traps
- **Focus order** is logical and preserves meaning
- **Focus visible** — keyboard focus indicator visible in at least one mode
- **Color** is not the sole means of conveying information, indicating action, or prompting response
- **Contrast** — text/images of text at minimum 4.5:1 (3:1 for large text); UI components at 3:1
- **Text resize** — up to 200% without assistive technology without loss of content/functionality
- **Flashing** — no content flashes more than 3 times per second; below general/red flash thresholds
- **Parsing** — valid markup, complete tags, unique IDs where markup is exposed
- **Name/Role/Value** — programmatically determinable for all UI components
- **Language** — default language programmatically determinable

PHASE 2 — HARDWARE PHYSICAL DESIGN

- **Clear floor space** minimum 760mm × 1220mm (30" × 48") provided at kiosk
- **Forward reach** — essential controls between 380mm–1220mm (15"–48") if unobstructed
- **Obstructed reach** — if obstruction 510mm, high reach 1220mm; if 635mm, high reach 1120mm
- **Side reach** — if parallel approach, essential controls between 380mm–1220mm; if obstruction 610mm, 1170mm
- **Knee clearance** — 230–685mm high, minimum 280mm deep at 230mm height
- **Toe clearance** — maximum 230mm high, minimum 430mm deep
- **Change in level** — ramped if >6.4mm; beveled 1:2 if 6.4–13mm
- **Alcove width** — 915mm min if forward approach and >610mm deep; 1525mm min if parallel and >380mm deep
- **Operable parts** — do not require grasping, pinching, or twisting of the wrist
- **Activation force** — 22.2N (5 lbs) for all controls
- **Tactile discernibility** — all controls discernible without activation and without vision
- **Key repeat** — delay adjustable to 2 seconds; rate adjustable to 1 character per 2 seconds
- **Double-strike delay** — adjustable to 0.5 seconds
- **Simultaneous actions** — at least one mode of operation does not require simultaneous user actions
- **Status indicators** — locking/toggle controls (e.g., Caps Lock) discernible visually and by touch or sound

PHASE 3 — DISPLAY & VISUAL

- **Screen visibility** — information legible from 1015mm (40") above center of clear floor space
- **Font** — sans serif; minimum 4.8mm (3/16") high based on uppercase "I"
- **Contrast** — minimum 3:1 luminosity contrast ratio for screen characters/background
- **Text enlargement** — if closed to platform AT enlargement, provide mode where "H" subtends 0.7°
- **Color coding** — not used as the only visual means of conveying information

PHASE 4 — CLOSED FUNCTIONALITY / AUDIO INTERFACE

- **Self-contained** — operable without requiring user to attach assistive technology (except personal headsets/induction loops)
- **Speech output** — provided for all visual information needed to operate closed functions
- **Delivery** — via integrated speaker, handset, or industry-standard 3.5mm headset jack
- **Speech coordination** — synchronized with on-screen information
- **User control** — speech interruptible and repeatable by user
- **Auto-interruption** — current speech interrupts on user action or when new speech begins
- **Masked entry** — masking characters spoken aloud (e.g., "asterisk"), not beeped
- **Private data** — output containing private data delivered only through private listening mechanism
- **Non-interfering audio** — no auto-playing interfering audible output lasting >3 seconds
- **Volume control (private)** — non-visual volume control for private listening
- **Volume control (speaker)** — incremental volume up to 65 dB SPL / 65 dBA
- **Ambient gain** — if ambient noise >45 dB, user-selectable gain of 20 dB above ambient
- **Volume reset** — automatic reset to default level after every use
- **Braille** — instructions for initiating speech mode provided in Braille
- **Language** — speech output in same human language as displayed content

- **Error identification** — speech output identifies and describes items in error
- **Transactional outputs** — speech includes all information necessary to complete or verify transaction
- **Timed response** — user alerted visually and by touch/sound; opportunity to indicate more time needed
- **Captioning** — multimedia with audio necessary for comprehension is captioned
- **Audio description** — mechanism to select and play audio description for video

PHASE 5 — INPUT SPECIFICATIONS

- **Alphabetic keys** — QWERTY layout; “F” and “J” keys tactilely distinct
- **Numeric keys** — 12-key telephone format; “5” key tactilely distinct
- **Function keys** — tactile symbols: Enter (raised circle), Clear (raised left arrow), Cancel (raised X), Add (raised +), Decrease (raised −)
- **Keytop contrast** — function keys contrast visually from background; characters contrast from key surfaces
- **Keytop height** — raised minimum 0.5mm above surrounding surfaces
- **Numeric pitch** — 16mm or 19mm grid spacing

PHASE 6 — BIOMETRICS & PRIVACY

- **Biometric alternative** — biometrics not the sole means of identification or control
- **PIN/Password** — non-biometric alternative available, OR second biometric using different biological characteristic
- **Privacy parity** — same degree of privacy for inputs and outputs available to all individuals
- **Screen blank** — if option provided in speech mode, blanks only when activated by user (not automatic)

PHASE 7 — DEPLOYMENT & OPERATIONS (US + Best Practice)

- **Density** — minimum 25% of kiosks in each location are accessible models
- **Stand-alone** — any single kiosk for a specific purpose is accessible
- **Functional parity** — accessible kiosks provide all functions available on inaccessible kiosks in same location
- **Identification** — accessible kiosks marked with International Symbol of Accessibility (visual and tactile)
- **Maintenance** — accessible kiosks maintained in proper working condition
- **Priority access** — users with disabilities given priority access to accessible kiosks
- **Equivalent service** — if accessible kiosk unavailable or user cannot use it, equivalent service provided upon request

PHASE 8 — EUROPE-SPECIFIC ADDENDA (When Deploying in EU)

- **RTT capability** — Real-Time Text available for two-way voice communication
- **RTT interoperability** — supports PSTN (ITU-T V.18), SIP/RFC 4103, or IMS protocols
- **Video communication** — QCIF resolution minimum; 12 FPS minimum; audio-video sync 100ms
- **Relay services** — access to text, sign, lip-reading, captioned telephony, and speech-to-speech relay services not prevented
- **Emergency services** — outgoing and incoming emergency access not prevented

- **Hearing aid coupling** — magnetic coupling (T-coil) provided for devices held to ear
- **Platform services** — software uses documented platform accessibility services/APIs
- **Documentation** — product documentation lists accessibility features and is available in accessible electronic format
- **Support services** — accommodate communication needs of individuals with disabilities

PHASE 9 — US-SPECIFIC ADDENDA (When Deploying in US)

- **DOT compliance** — if airport/air travel: meet DOT ACAA kiosk and website deadlines
- **Joint liability** — if shared-use airport kiosks: joint and several liability with airport operator
- **Usability testing** — consult with individuals/organizations representing visual, auditory, tactile, and cognitive disabilities
- **Equivalent fares** — disclose and offer web-based discount fares to passengers unable to use websites
- **Online accommodation** — provide online form for disability accommodation requests
- **State law review** — verify compliance with applicable state accessibility laws (e.g., California Unruh)
- **Section 508** — if federal procurement: provide VPAT and meet revised Section 508 standards

6. ADVANCED ACCESSIBILITY — VOICE, TACTILE & PAYMENT SYSTEMS

6.1 VOICE RECOGNITION & SPEECH COMMAND SYSTEMS

6.1.1 Scope & Applicability Voice recognition (VR) and speech command (SC) interfaces are increasingly deployed in self-service kiosks for hands-free operation, navigation, and transaction completion. This section establishes harmonized technical requirements for VR/SC systems integrated into ICT kiosks, ensuring accessibility for users with motor impairments, visual impairments, and cognitive disabilities while preserving privacy and security.

6.1.2 Core Requirements

Requirement	Harmonized Specification	Rationale
Activation Method	Voice interface activated by dedicated physical button OR proximity detection (3 seconds in interface zone) with audible confirmation	Prevents accidental activation; aligns with tactile control requirements
Wake Word Option	If wake-word activation used, must be configurable/disabled; wake word shall not be sole activation method	Users with speech impairments may be unable to pronounce wake words consistently
Microphone Array	Minimum 4-element beamforming array; frequency response 100 Hz –8 kHz; SNR 60 dB	Ensures reliable pickup in noisy public environments
Noise Cancellation	Adaptive noise cancellation with 20 dB suppression of ambient noise (measured per IEC 60268-16)	Public spaces typically exceed 60 dB ambient

Table 12 – continued

Requirement	Harmonized Specification	Rationale
Beam Focusing	Configurable beam width 30°–90°; user-position tracking via acoustic localization	Reduces crosstalk from adjacent kiosks or passersby
Voice Profile Storage	Optional local voice profile storage; if cloud-based, explicit user consent required per session	Privacy compliance (GDPR / state privacy laws)
Language Support	Primary deployment language + at least 2 additional languages configurable via UI	Aligns with multilingual kiosk requirements
Command Vocabulary	Minimum 50 core navigation commands (“next,” “back,” “select,” “cancel,” “help,” “repeat,” “volume up/down,” “start over”); all commands discoverable via audio help	Ensures comprehensive hands-free navigation
Command Confirmation	Auditory and visual confirmation of recognized command before execution; 3-second undo window	Prevents accidental transactions
Error Recovery	After 3 consecutive recognition failures, system offers alternative input mode (touch, tactile, or attendant call)	Prevents user trapping
Speech Rate Adaptation	System adapts response speech rate to user’s speech rate ($\pm 30\%$ configurable)	Cognitive accessibility
Barge-In	User can interrupt system prompts with commands	Efficiency and control
Privacy Indicator	Visible LED indicator when microphone is active; LED positioned within 150mm of microphone aperture	Transparency per GDPR Article 13
Data Retention	Voice recordings retained maximum 24 hours for quality improvement; anonymized; user opt-out available	Privacy by design
Fallback Mode	If VR system fails, kiosk automatically reverts to tactile/audio interface without requiring kiosk restart	Resilience

6.1.3 Accessibility-Specific Voice Features

Feature	Specification
Dysarthria Accommodation	System trained on dysarthric speech samples; recognition accuracy 80% for mild-to-moderate dysarthria
Stutter Accommodation	System tolerates interjections and repetitions; does not timeout during disfluencies
Accent Robustness	Recognition accuracy 85% for top 5 regional accents in deployment geography
Whisper Mode	Functional recognition at 30 dB SPL input level for private voice entry

Table 13 – continued

Feature	Specification
Visual Feedback	Real-time waveform or text display of recognized speech for deaf/hard-of-hearing users
Closed Captioning	All system voice prompts simultaneously displayed as text with speaker identification

6.1.4 Privacy & Security

Requirement	Specification
Consent	Explicit audio prompt + visual prompt before first voice interaction; consent logged locally
Encryption	Voice data encrypted in transit (TLS 1.3) and at rest (AES-256)
Local Processing	Primary command recognition processed on-device; cloud processing only for complex natural language queries with explicit consent
Anonymization	Voiceprints hashed with salt; no biometric voice templates stored without explicit opt-in
Audit Log	All voice data access logged with timestamp and purpose; user-accessible upon request

6.2 TACTILE HARDWARE DEVICES & HAPTIC INTERFACES

6.2.1 Scope & Applicability Tactile hardware devices provide non-visual access to kiosk interfaces through refreshable braille, tactile displays, haptic feedback, and dedicated tactile control surfaces. This section specifies requirements for integrated and peripheral tactile devices deployed in conjunction with ICT kiosks.

6.2.2 Refreshable Braille Displays

Requirement	Harmonized Specification	Test Method
Cell Configuration	Minimum 40 cells × 8 dots per cell (Grade 2 braille support)	Physical inspection
Dot Height	0.5mm ±0.05mm above base surface	Caliper measurement
Dot Spacing	2.5mm center-to-center horizontally; 2.5mm vertically	Caliper measurement
Cell Spacing	6.0mm center-to-center	Caliper measurement
Refresh Rate	200ms full line refresh	Oscilloscope / high-speed camera
Cursor Routing	Tactile cursor routing keys above each cell; activation force 1.5N	Force gauge
Status Cells	Minimum 3 dedicated status cells (beginning or end of line)	Physical inspection

Table 15 – continued

Requirement	Harmonized Specification	Test Method
Braille Codes	Supports UEB (Unified English Braille), Eurobraille, and at least 2 national braille codes	Software verification
Compatibility	USB HID class or Bluetooth HID; plug-and-play with Windows/macOS/Linux screen readers	Protocol analyzer
Mounting	Securely mountable at 380mm–1220mm reach range; adjustable angle 0°–45°	Measurement
Protection	IP54 minimum for public deployment; anti-microbial coating on tactile surfaces	IEC 60529

6.2.3 Tactile Graphic Displays

Requirement	Harmonized Specification
Resolution	Minimum 120 × 60 tactile pixels (taxels) per 100mm ²
Pin Height	0.7mm ±0.1mm extended; flush when retracted
Pin Density	Minimum 4 pins/mm
Refresh Rate	500ms for full display
Touch Sensing	Capacitive overlay for finger position tracking; multi-touch 2 points
Audio Correlation	Tactile display synchronized with speech output; audio description of tactile elements
Content Types	Maps, diagrams, flowcharts, signatures, and simplified facial recognition

6.2.4 Haptic Feedback Systems

Requirement	Harmonized Specification
Actuator Type	Linear resonant actuator (LRA) or eccentric rotating mass (ERM) with closed-loop control
Frequency Range	50–300 Hz; configurable per UI element type
Intensity Levels	Minimum 5 discernible intensity levels; maximum 2.0 G peak acceleration
Pattern Library	Minimum 10 distinct haptic patterns: tap, double-tap, long press, edge, error, success, warning, scroll, selection, cancellation
Correlation	Haptic feedback synchronized with audio and visual events within 50ms
Customizability	User can disable haptics or reduce intensity; setting persists across sessions
Tactile Landmarks	Physical tactile landmarks (raised dots or bars) at screen corners and midpoints for orientation

6.2.5 Dedicated Tactile Keypads

Requirement	Harmonized Specification
Layout	Standard telephone 12-key + 5 function keys (Enter, Clear, Cancel, Help, Menu)
Key Travel	1.0mm $\pm$ 0.3mm tactile feedback
Key Force	1.5N $\pm$ 0.5N activation force
Key Spacing	19mm center-to-center minimum
Key Shape	Convex surface 0.5mm height; distinct shapes for function keys (Enter=circle, Clear=left arrow, Cancel=X, Help=question mark, Menu=grid)
Braille Labels	Grade 1 braille labels on all keys; permanent (not adhesive)
Backlight	Adjustable backlight 0–100%; does not interfere with braille readability
Connection	USB-C or Bluetooth 5.0; paired securely to host kiosk

6.3 PAYMENT TERMINAL ACCESSIBILITY

6.3.1 Scope & Applicability Payment terminals integrated into or attached to self-service kiosks must provide equivalent accessibility for all transaction types, including EMV chip, contactless/NFC, magnetic stripe, and mobile wallet payments. This section harmonizes US ADA Title III requirements with European EAA/PSD2 accessibility expectations.

6.3.2 Audio Output Requirements

Requirement	Harmonized Specification	Source
Transaction Total	Amount verbally announced before payment authorization; repeated on request	KMA CoP; ADA Title III
Payment Method Prompt	Audio prompt for payment method selection with enumeration of available methods	EAA best practice
Card Insertion	Audio guidance for correct card insertion orientation (chip-first, magnetic stripe position)	KMA CoP
PIN Entry Feedback	Each digit spoken as masked character (“asterisk” or “dot”); NOT beeped	DOT §382.57(c)(5)(i)(A)
Contactless Guidance	Audio instruction for tap location and hold duration (“Hold card near reader for 2 seconds”)	KMA CoP
Transaction Status	Audio confirmation of success/failure with specific error description if declined	ADA Title III
Receipt Option	Audio offer of printed, emailed, or SMS receipt with privacy warning for email/SMS	GDPR / state privacy
Currency	Currency name spoken (e.g., “twenty-five dollars and fifty cents”) not just numeric	Cognitive accessibility

6.3.3 Physical Design Requirements

Requirement	Harmonized Specification	Notes
Reach Range	Payment terminal (card slot, NFC reader, PIN pad) within 380mm–1220mm forward reach	ADA 2010 §308
PIN Pad Tactile	Keys tactilely discernible; 5-key layout minimum (0–9 via telephone format + Enter + Clear + Cancel)	EN 301 549 §8.4.1
Key Contrast	Keys contrast 3:1 minimum from surrounding surface	DOT §382.57(c)(6)(iv)(A)
NFC Reader Location	Tactilely identifiable (raised ring or bracket); audio prompt when card detected	KMA CoP
Card Slot Tactile	Beveled or funnelled entry; tactile arrow indicating insertion direction	KMA CoP
Contactless Range	Effective range 0–40mm; audio feedback at 20mm and 10mm proximity	EMVCo L1
Terminal Angle	PIN pad angled 15°–30° from vertical for visibility and reach	Ergonomic best practice
Stability	Terminal stable during one-handed operation; does not shift with 22.2N force	ADA 2010 §309.4

6.3.4 PIN Entry Accessibility

Requirement	Harmonized Specification
Audio PIN Entry	Alternative to physical keypad: voice PIN entry with whisper mode and barge-in prevention
Large-Print Overlay	Optional detachable large-print keypad overlay available on request
Tactile PIN Pad	Dedicated tactile PIN pad with braille labels and raised dot on “5”
Timeout	PIN entry timeout 60 seconds; 30-second warning announced
Error Handling	After 3 incorrect PINs, account lockout with audio explanation and attendant call option
Privacy Shield	Physical privacy shield optional; if present, must not obstruct audio output

6.3.5 Mobile Wallet & QR Code Accessibility

Requirement	Harmonized Specification
QR Code Audio	If QR code payment used, audio description of QR location and scanning confirmation
NFC Phone Guidance	Audio instruction for phone positioning; haptic confirmation when NFC handshake detected
Biometric Fallback	If kiosk supports biometric payment authorization, PIN alternative always available
Receipt Delivery	Accessible electronic receipt (HTML email with semantic markup) default option

6.4 WIRELESS AUDIO & HEARING AID COMPATIBILITY

Requirement	Harmonized Specification	US Source	Europe Source
Bluetooth Audio	Bluetooth 5.0+ with A2DP and HFP profiles; pairing mode activated via tactile button	KMA CoP	KMA CoP
Pairing Timeout	Pairing mode timeout 120 seconds; audio countdown	KMA CoP	KMA CoP
Audio Codec	AAC, aptX, or LC3 codec support	KMA CoP	KMA CoP
Latency	End-to-end latency 150ms for audio output	KMA CoP	KMA CoP
Hearing Aid Coupling	T-coil coupling (magnetic field strength –15 dB A/m min per IEC 60118-4)	ADA best practice	EN 301 549 §8.2.2
Induction Loop	Fixed induction loop (audio frequency induction loop) at headset jack area optional but recommended	KMA CoP	EN 301 549 §8.2.2
Volume Independence	Wireless volume independent of speaker/headset volume; persists across sessions for paired device	KMA CoP	KMA CoP

6.5 OUTDOOR & ENVIRONMENTAL CONSIDERATIONS

Requirement	Harmonized Specification	Notes
IP Rating	IP54 minimum for audio connections; IP65 for fully outdoor kiosks	IEC 60529
Saline Air Resistance	ASTM B117 500-hour salt spray test for coastal deployments	KMA CoP
Temperature Range	Operating –20°C to +50°C; storage –30°C to +60°C	KMA CoP
Anti-Glare Display	Matte or anti-glare coating; luminance 800 cd/m ² for direct sunlight readability	KMA CoP
Audio Connection Sealing	3.5mm jack with silicone flap or magnetic cover; corrosion-resistant contacts (gold-plated)	KMA CoP
Anti-Microbial	Cu+ or Ag+ ion coating on all tactile surfaces; 99% reduction per ISO 22196	KMA CoP
Vibration Resistance	IEC 60068-2-6: 5–500 Hz, 2G random vibration; no functional degradation	KMA CoP

6.6 AI & EDGE COMPUTING CONSIDERATIONS

Requirement	Harmonized Specification
Local Inference	Voice recognition, biometric matching, and natural language processing performed on-device where feasible
Cloud Disclosure	Explicit audio + visual notification when data is transmitted to cloud for processing; purpose stated
Opt-In Consent	Cloud AI features require explicit opt-in; default is local-only processing

Table 25 – continued

Requirement	Harmonized Specification
Model Transparency	Accessibility features (e.g., voice recognition) trained on diverse datasets including disability-specific speech patterns
Fallback	If cloud connection lost, kiosk operates with local AI capabilities without degradation of core accessibility functions
Bias Testing	Quarterly bias audit for voice recognition accuracy across disability types, ages, genders, and accents

7. UNIFIED COMPLIANCE CHECKLIST — PHASE 10: ADVANCED ACCESSIBILITY

Phase 10 applies to all next-generation kiosk deployments and is mandatory for installations in airports, federal buildings, healthcare facilities, and outdoor smart-city environments. Retail and hospitality deployments should implement Phase 10 on a rolling basis by 2028.

10.1 VOICE RECOGNITION & SPEECH COMMAND

- **Activation** — voice interface activated by physical button OR proximity detection (3 sec) with audible confirmation
- **Wake word configurability** — wake-word activation can be disabled; never the sole activation method
- **Microphone array** — minimum 4-element beamforming; 100 Hz–8 kHz; SNR 60 dB
- **Noise cancellation** — adaptive suppression 20 dB ambient noise per IEC 60268-16
- **Beam focusing** — configurable 30°–90° beam width; acoustic localization
- **Language support** — primary language + 2 additional languages configurable
- **Core commands** — minimum 50 navigation commands; all discoverable via audio help
- **Command confirmation** — auditory + visual confirmation before execution; 3-second undo window
- **Error recovery** — after 3 recognition failures, alternative input mode offered automatically
- **Speech rate** — system response rate adapts to user speech rate ($\pm 30\%$ configurable)
- **Barge-in** — user can interrupt system prompts
- **Privacy LED** — visible indicator when microphone active; within 150mm of microphone
- **Data retention** — voice recordings retained 24 hours; anonymized; user opt-out available
- **Fallback mode** — automatic reversion to tactile/audio interface on VR failure
- **Dysarthria accommodation** — 80% accuracy for mild-to-moderate dysarthria
- **Stutter accommodation** — tolerates disfluencies; no timeout during stuttering
- **Accent robustness** — 85% accuracy for top 5 regional accents
- **Whisper mode** — functional recognition at 30 dB SPL input
- **Visual feedback** — real-time text display of recognized speech
- **Closed captioning** — all voice prompts displayed as text with speaker ID
- **Consent** — explicit audio + visual prompt before first voice interaction
- **Encryption** — TLS 1.3 in transit; AES-256 at rest
- **Local processing** — primary commands on-device; cloud only with explicit consent
- **Anonymization** — voiceprints hashed with salt; no storage without opt-in

- **Audit log** — all voice data access logged; user-accessible upon request

10.2 TACTILE HARDWARE DEVICES

- **Refreshable braille** — minimum 40 cells $\times$ 8 dots; UEB + Eurobraille support
- **Dot specifications** — 0.5mm $\pm$ 0.05mm height; 2.5mm spacing; 6.0mm cell spacing
- **Refresh rate** — 200ms full line refresh
- **Cursor routing** — tactile keys above each cell; 1.5N activation force
- **Status cells** — minimum 3 dedicated status cells
- **Compatibility** — USB HID or Bluetooth HID; plug-and-play
- **Mounting** — 380mm–1220mm reach; 0°–45° adjustable angle
- **Protection** — IP54 minimum; anti-microbial coating
- **Tactile graphic display** — minimum 120 $\times$ 60 taxels per 100mm²; 0.7mm pin height
- **Haptic feedback** — LRA/ERM actuator; 50–300 Hz; 5 intensity levels; 10 distinct patterns
- **Haptic sync** — synchronized with audio/visual within 50ms
- **Tactile landmarks** — raised dots/bars at screen corners and midpoints
- **Tactile keypad** — 12-key telephone + 5 function keys; 19mm spacing; braille labels
- **Key travel** — 1.0mm $\pm$ 0.3mm tactile feedback; 1.5N $\pm$ 0.5N force

10.3 PAYMENT TERMINAL ACCESSIBILITY

- **Audio total** — transaction amount verbally announced before authorization
- **Method prompt** — audio enumeration of available payment methods
- **Card guidance** — audio instruction for correct card insertion orientation
- **PIN feedback** — digits spoken as “asterisk” or “dot”; never beeped
- **Contactless guidance** — audio instruction for tap location and hold duration
- **Status audio** — success/failure confirmation with specific error description
- **Receipt options** — audio offer of printed, emailed, or SMS receipt
- **Currency spoken** — full currency name spoken, not just numeric
- **Reach range** — payment terminal within 380mm–1220mm forward reach
- **PIN pad tactile** — keys tactilely discernible; telephone layout; 3:1 contrast
- **NFC tactile** — raised ring or bracket identifying contactless reader
- **Card slot tactile** — beveled entry; tactile arrow for insertion direction
- **Terminal angle** — 15°–30° from vertical
- **Audio PIN entry** — voice PIN alternative with whisper mode
- **Tactile PIN pad** — dedicated braille-labelled PIN pad available
- **PIN timeout** — 60 seconds entry time; 30-second warning
- **QR code audio** — audio description of QR location and scan confirmation
- **NFC phone guidance** — audio instruction for phone positioning; haptic confirmation
- **Biometric fallback** — PIN always available as alternative to biometric payment
- **Accessible receipt** — electronic receipt in semantic HTML as default

10.4 WIRELESS AUDIO & HEARING AID COMPATIBILITY

- **Bluetooth 5.0+** — A2DP and HFP profiles; tactile-activated pairing
- **Pairing timeout** — 120-second pairing window with audio countdown
- **Codec support** — AAC, aptX, or LC3
- **Latency** — 150ms end-to-end
- **T-coil coupling** — magnetic field strength -15 dB A/m minimum per IEC 60118-4

- **Induction loop** — fixed induction loop at headset area (recommended)
- **Volume independence** — wireless volume independent of speaker/headset

10.5 OUTDOOR & ENVIRONMENTAL

- **IP rating** — IP54 minimum (audio); IP65 for outdoor kiosks
- **Salt spray** — ASTM B117 500-hour test for coastal deployment
- **Temperature** — operating -20°C to $+50^{\circ}\text{C}$
- **Anti-glare** — matte coating; 800 cd/m² luminance
- **Audio sealing** — silicone flap or magnetic cover on 3.5mm jack; gold-plated contacts
- **Anti-microbial** — Cu+/Ag+ coating; 99% reduction per ISO 22196
- **Vibration** — IEC 60068-2-6 compliant (5–500 Hz, 2G random)

10.6 AI & EDGE COMPUTING

- **Local inference** — voice, biometric, NLP processed on-device where feasible
- **Cloud disclosure** — explicit notification when data transmitted to cloud
- **Opt-in default** — cloud AI requires explicit opt-in; local-only default
- **Diverse training** — models trained on disability-specific speech patterns
- **Cloud fallback** — no degradation of accessibility on cloud connection loss
- **Bias audit** — quarterly accuracy audit across disability types, ages, genders, accents

8. IMPLEMENTATION ROADMAP

For Manufacturers

1. **Design Phase** — Apply Phase 1–6 requirements as baseline for all new kiosk designs; integrate Phase 10 for next-generation products
2. **Testing Phase** — Conduct usability testing with disability organizations including voice recognition testing with dysarthric and stuttering users
3. **Documentation** — Prepare VPAT (US federal) or EN 301 549 conformance statement (EU); include Phase 10 addendum
4. **Certification** — Third-party audit recommended; no official US certifier exists for ADA; EU uses self-certification against EN 301 549
5. **Tactile Integration** — Partner with tactile device manufacturers (Storm, EZY) for certified integration kits

For Deployers

1. **Site Survey** — Verify clear floor space, reach ranges, approach paths, and acoustic environment for voice recognition
2. **Density Planning** — Ensure 25% accessible units per location (US mandatory; EU best practice); Phase 10 units count toward accessible density
3. **Maintenance Plan** — Include tactile devices, microphone arrays, and payment terminals in preventive maintenance schedule
4. **Staff Training** — Train personnel on equivalent service provision, priority access policies, and tactile device assistance

5. **Privacy Compliance** — Implement voice data retention policies and consent management per GDPR / CCPA / state laws

9. KEY GLOSSARY

Term	Definition
Closed Functionality	ICT limited by characteristics preventing user from attaching, installing, or using assistive technology
Clear Floor Space	Unobstructed space for wheelchair approach and operation
Equivalent Service	Same information/services provided as conveniently, independently, and with same privacy as non-disabled users
ICT	Information and Communication Technology
RTT	Real-Time Text —text transmitted character-by-character as typed
SSK	Interactive Self-Service Kiosk (proposed harmonized term)
Tactilely Discernible	Capable of being identified by touch without activating the control
WCAG	Web Content Accessibility Guidelines (W3C)
VR	Voice Recognition —automatic speech recognition for command and control
SC	Speech Command —voice-activated interface navigation
LRA	Linear Resonant Actuator —type of haptic vibration motor
ERM	Eccentric Rotating Mass —type of haptic vibration motor
Taxel	Tactile pixel —a single addressable pin in a tactile graphic display
UEB	Unified English Braille —standard braille code for English
T-Coil	Telecoil —induction coil in hearing aids for magnetic audio coupling
EMV	Europay, MasterCard, Visa —global standard for chip-based payment cards
NFC	Near Field Communication —contactless communication protocol
PIN	Personal Identification Number
VPAT	Voluntary Product Accessibility Template —US federal procurement conformance document

APPENDIX A — DEVICE-SPECIFIC SPECIFICATIONS FOR ASSISTIVE PERIPHERALS

A.1 Storm AudioPad Series

The Storm AudioPad is a tactile audio interface designed for integration with interactive kiosks. It provides combined audio output, tactile input, and voice recognition capabilities in a single peripheral unit.

A.1.1 Storm AudioPad Pro (Model SAP-2024)

Specification	Value	Compliance
Dimensions	180mm (W) × 120mm (D) × 45mm (H)	Fits within ADA reach envelope
Weight	380g	Mountable without reinforcement
Audio Output	3.5mm stereo jack + integrated mono speaker (2W, 8Ω)	DOT §382.57(c)(5); EN 301 549 §5.1.3
Speaker Frequency	300 Hz –8 kHz ±3 dB	Voice intelligibility optimized
Microphone	4-element MEMS array; beamforming; 100 Hz –10 kHz	Phase 10 §10.1
Microphone SNR	62 dB	Exceeds 60 dB minimum
Voice Recognition	On-device neural engine; supports 45 languages; offline capable	Phase 10 §10.1
Dysarthria Mode	Dedicated recognition model; 82% accuracy benchmarked	Phase 10 §10.1
Tactile Keys	19 keys (12 numeric + 7 function); 19mm pitch; 1.2mm travel	Phase 10 §10.2
Key Force	1.6N nominal	Within 1.5N ±0.5N spec
Braille Labels	Grade 1 permanent laser-etched; dot height 0.55mm	Phase 10 §10.2
Haptic Engine	Dual LRA; 5 intensity levels; 12 patterns	Phase 10 §10.2
Connection	USB-C (primary) + Bluetooth 5.2 (secondary)	Plug-and-play HID
Mounting	VESA 75mm pattern; quick-release bracket; 0°–45° tilt	ADA §308 compliant
Power	USB-C PD 5V/1A; no external power required	Standard USB power
Environmental	IP54 rated; anti-microbial ABS housing	Phase 10 §10.5
Certifications	FCC Part 15 Class B; CE marked; RoHS 3; WEEE	US/EU market ready
Warranty	3 years parts and labor	Manufacturer standard

A.1.2 Storm AudioPad Mini (Model SAP-Mini)

Specification	Value	Notes
Dimensions	140mm (W) × 90mm (D) × 35mm (H)	Compact for space-constrained kiosks
Weight	220g	Portable/handheld option
Audio	3.5mm jack only (no integrated speaker)	Requires headset or external speaker
Microphone	2-element array; 100 Hz –8 kHz	Basic voice recognition
Tactile Keys	15 keys (12 numeric + 3 function)	Reduced function set
Connection	USB-C only	No Bluetooth
Mounting	Adhesive + magnetic dock	Temporary or semi-permanent
Power	USB-C 5V/0.5A	Low power
Environmental	IP43 rated	Indoor use only

A.1.3 Storm AudioPad Integration Guide **Physical Integration:**

- Mount at 900mm–1100mm height for forward reach compliance
- Position within 150mm of kiosk front face to maintain clear floor space
- Cable routing through internal kiosk channel; no external cables across approach path
- Quick-release bracket allows removal for maintenance without tools

Software Integration:

- HID keyboard emulation for tactile key input (no custom driver required)
- Audio device enumerated as standard USB audio class
- Voice recognition API: RESTful local endpoint (<http://localhost:8844/v1/recognize>)
- SDK available for Windows, Linux, Android (Java, C++, Python bindings)
- Firmware update via USB mass storage mode or OTA (admin-configured)

Accessibility API:

```
Storm AudioPad exposes the following accessibility interfaces:  
- AT-SPI2 (Linux)  
- UI Automation (Windows)  
- AccessibilityService (Android)  
- NSAccessibility (macOS — via companion driver)
```

A.2 EZY Pad Tactile Interface Series

The EZY Pad is a modular tactile input system designed for users who require large-format tactile controls or alternative input methods beyond standard keyboards.

A.2.1 EZY Pad Standard (Model EZY-STD-40)

Specification	Value	Compliance
Dimensions	320mm (W) × 200mm (D) × 25mm (H)	Fits on kiosk shelf
Weight	650g	Stable during use
Tactile Surface	40 programmable capacitive-tactile cells; 20mm × 20mm each	Large target size
Cell Feedback	Individual LRA per cell; 8 intensity levels; programmable patterns	Haptic customization
Braille Display	Optional 40-cell refreshable braille module (add-on)	Phase 10 §10.2
Key Layout	Fully programmable; supports QWERTY, telephone, directional pad, and custom layouts	Flexibility
Key Labels	Swappable tactile overlays (braille, large print, symbols); magnetic attachment	Multi-user accommodation
Connection	USB-C + Bluetooth 5.1	Dual connectivity
Power	USB-C 5V/1A; internal battery 2000mAh (8-hour wireless operation)	Battery backup
Environmental	IP55 rated; sealed silicone surface; anti-microbial	Phase 10 §10.5
Mounting	Non-slip base; optional clamp bracket for kiosk attachment	Stable operation

A.2.2 EZY Pad Large (Model EZY-LRG-60)

Specification	Value	Notes
Dimensions	480mm (W) × 300mm (D) × 30mm (H)	Full-hand coverage
Tactile Surface	60 programmable cells; 25mm × 25mm each	Extra-large targets

Table 30 – continued

Specification	Value	Notes
Intended Use	Users with limited fine motor control; tremor accommodation	Motor impairment
Cell Spacing	5mm gap between cells; raised border	Prevents accidental activation
Activation Force	2.0N $\pm$ 0.5N	Higher force reduces false triggers
Other Specs	Same as EZY-STD-40	Shared platform

A.2.3 EZY Pad Integration Guide **Physical Integration:**

- Place on dedicated pull-out shelf at 720mm–850mm height (seated operation)
- Shelf minimum 400mm $\times$ 300mm; supports 5kg load
- Retractable tether (800mm) prevents loss/theft while allowing flexible positioning
- Tether breakaway force 50N (safety release)

Software Integration:

- Configuration software (EZY Config Pro) allows layout programming via drag-and-drop
- Layouts exportable/importable as JSON; shareable across kiosk fleet
- SDK provides direct cell access for custom haptic applications
- Compatible with JAWS, NVDA, VoiceOver (via standard screen reader protocols)

Tactile Overlay Library:

- Overlay A: Standard telephone (12-key + 3 function)
- Overlay B: QWERTY alphanumeric (reduced 40-key)
- Overlay C: Directional navigation (arrow keys + Enter/Back/Home)
- Overlay D: Payment-specific (0–9 + Enter + Clear + Cancel + Help)
- Overlay E: Blank (programmable via software)

A.2.4 ANKER EAA-Pad / ADA-Pad

The ANKER EAA-Pad (marketed as the ADA-Pad in North America) is a compact tactile navigation and audio interface manufactured by ANKER Solutions GmbH (Bielefeld, Germany). Designed specifically for self-service terminals, it provides directional navigation, audio output, and menu control in a single, low-profile unit. It is particularly well-suited for retail self-checkout, ticketing, information terminals, and self-service scales where space is constrained and full alphanumeric input is not required.

A.2.4.1 ANKER EAA-Pad (Model EAA-PAD-01)

Specification	Value	Compliance
Dimensions	103.9mm (H) × 68mm (W) × ~25mm (D)	Compact; fits within any reach envelope
Weight	~180g (estimated)	Minimal mounting load
Tactile Controls	4 directional arrow keys (up/down/left/right) + center ENTER button + 1 function button	6 tactile controls total
Key Type	Raised tactile rubber/silicone keys; discernible by touch without activation	DOT §382.57(c)(6)(i); EN 301 549 §5.5.2
Key Force	~2.0N (estimated typical)	Within operable parts range
Audio Output	3.5mm 4-pole TRRS jack (stereo audio + microphone)	DOT §382.57(c)(5); EN 301 549 §5.1.3
Audio Support	Headphones and headset microphone; integrated microphone support for voice guidance	Phase 10 §10.1
Microphone	Via 3.5mm jack (headset mic); no integrated microphone array	Requires headset with boom mic for voice input
RGB Backlighting	3 individually controllable zones; full color spectrum	Visual identification aid
Backlight Purpose	Facilitates location by users with low vision; customizable to brand colors	KMA CoP
Connection	USB-C (rear-mounted)	USB HID class; plug-and-play
Mounting Orientation	Dip switch on rear selects vertical or horizontal orientation	Flexible installation
Mounting Options	Horizontal surface mount, vertical fascia mount, pole mount, custom bracket	Kiosk-integrated
Compatibility	Windows, Linux, Android; certified for SiteKiosk Online	Software-agnostic HID

Table 31 – continued

Specification	Value	Compliance
Screen Reader Support	JAWS, NVDA, VoiceOver compatible via host kiosk software	Standard AT protocols
Voice Guidance	Software-dependent; host application provides spoken prompts via audio jack	Phase 10 §10.1
Environmental	Indoor use; IP rating not specified (assume IP40 minimum)	Indoor retail/office
Power	USB-C bus-powered (5V)	No external power required
Certifications	CE marked; DIN EN 301-549 conformity declared	EU market ready
Status	Final stages of product development (as of Q3 2026)	Check availability before procurement
Warranty	Standard manufacturer warranty (confirm with ANKER)	—

A.2.4.2 ANKER ADA-Pad (North American Variant) The ADA-Pad is the North American market variant of the EAA-Pad, functionally identical but positioned for ADA Title III compliance in the US market.

Specification	Value	Notes
Dimensions	103.9mm (H) × 68mm (W)	Identical to EAA-Pad
Features	Same tactile keys, audio jack, RGB backlighting, USB-C	Identical hardware
Compliance Positioning	ADA Title III; Section 508	US regulatory framing
Distributor	Partner Tech Corporation (North America)	US-based support
Certifications	FCC Part 15 Class B (assumed)	Confirm with distributor

A.2.4.3 ANKER EAA-Pad Integration Guide Physical Integration:

- Mount at 850mm–1100mm height for standing forward reach; 720mm–850mm for seated operation
- Surface area required: minimum 120mm × 90mm including clearance

- Cable routing through rear USB-C port; use right-angle USB-C adapter for tight spaces
- Orientation dip switch must be set BEFORE mounting to ensure correct key mapping in software
- RGB backlight should be configured to high-contrast color (e.g., white or yellow on dark fascia) for low-visibility location

Software Integration:

- Enumerates as standard USB HID keyboard device
- Key mappings (default):
- Arrow Up: HID code 0x52 (Keyboard Up Arrow)
- Arrow Down: HID code 0x51 (Keyboard Down Arrow)
- Arrow Left: HID code 0x50 (Keyboard Left Arrow)
- Arrow Right: HID code 0x53 (Keyboard Right Arrow)
- ENTER (center): HID code 0x28 (Keyboard Return/Enter)
- Function button: HID code 0x3A (Keyboard F1) — configurable in host software
- No custom driver required for basic operation
- SiteKiosk Online provides native support with accessibility templates
- For custom applications, map HID codes to navigation events in kiosk software

Audio Integration:

- 3.5mm jack presents as standard USB audio device (via host USB-C audio passthrough or separate audio endpoint)
- Host kiosk software must route all accessibility audio (screen reader, voice guidance, transaction prompts) to the EAA-Pad audio jack
- Recommend providing disposable headset covers or sanitizable over-ear headphones for hygiene
- If voice recognition is required, user must supply or kiosk must provide a headset with integrated microphone

Accessibility Workflow:

1. User locates EAA-Pad by RGB backlight (always on in standby, or activated by proximity sensor)
2. User presses Function button to activate accessibility mode (host-dependent)
3. Host software switches to audio-guided navigation; all visual elements spoken via audio jack
4. User navigates with arrow keys; selects with ENTER
5. Function button opens settings menu (volume, speech rate, language, help)
6. Session ends; audio jack auto-mutes; RGB returns to standby state

Limitations & Considerations:

- **No alphanumeric input:** EAA-Pad provides navigation only; for PIN entry or text input, host must support:
- On-screen numeric keypad navigable via arrow keys + ENTER

- External tactile keypad (EZY Pad or Storm AudioPad) for full input
- Voice recognition via headset microphone
- **No integrated speaker:** Requires user-supplied or kiosk-provided headphones/headset
- **No braille display:** Purely tactile button interface; no refreshable braille
- **No haptic feedback beyond key press:** No programmable haptic patterns
- **Single-function button:** Only one programmable function key; limited compared to Storm AudioPad Pro's 7 function keys

A.3 Additional Referenced Assistive Peripherals

A.3.1 Orbit Research 20+ Braille Display

Specification	Value
Cells	40 cells × 8 dots
Dot Height	0.5mm
Connection	USB-C / Bluetooth
Compatibility	Certified for JAWS, NVDA, VoiceOver
Kiosk Integration	Mounts via Storm AudioPad bracket adapter
Power	USB bus-powered

A.3.2 HumanWare Brailiant BI 40X

Specification	Value
Cells	40 cells × 8 dots
Connection	USB-C / Bluetooth 5.0
Features	Perkins-style keyboard; note-taking capability
Kiosk Mode	HID-only mode for kiosk use (disables note-taking)
Mounting	VESA 75mm compatible

A.3.3 HaptX Gloves (VR/Tactile Kiosk Applications)

Specification	Value
Application	Advanced tactile feedback for VR-enabled kiosks
Force Feedback	133 tactile actuators per hand; 4 lbs force per finger
Integration	USB + proprietary wireless receiver
Accessibility	Not recommended as primary interface; supplementary only
Note	Requires attendant assistance for donning; not self-service compliant as sole interface

A.3.4 Induction Loop Systems (Ampetronic ILD Series)

Specification	Value
Model	ILD100 (kiosk-integrated)
Coverage	1.2m × 1.2m area at kiosk face
Compliance	IEC 60118-4; BS 7594
Field Strength	−15 dB A/m minimum
Frequency	100 Hz −5 kHz flat response
Installation	Loop antenna embedded in kiosk fascia or floor mat
Power	12V DC from kiosk PSU

A.3.5 AfterShokz / Shokz OpenRun Pro (Bone Conduction Headsets)

Specification	Value
Type	Bone conduction wireless headset
Bluetooth	5.1; multipoint pairing
Use Case	Users with conductive hearing loss; open-ear for situational awareness
Kiosk Pairing	Auto-pairing mode when placed in kiosk induction zone
Battery	10-hour life; quick charge (5 min = 1.5 hours)
Note	Kiosk should offer bone conduction as alternative to standard headsets

A.4 Peripheral Compatibility Matrix

Peripheral	USB HID	Bluetooth	Audio Class	Screen Reader	Kiosk SDK	Phase 10 Compliant
Storm AudioPad Pro						
Storm AudioPad Mini		—				Partial*
EZY Pad Standard			—			
EZY Pad Large			—			
ANKER EAA-Pad / ADA-Pad		—	†		—	Partial‡
Orbit Research 20+			—		—	

Table 38 – continued

Peripheral	USB HID	Bluetooth	Audio Class	Screen Reader	Kiosk SDK	Phase 10 Compliant
Brailliant BI 40X			—		—	
HaptX Gloves			—	—		Supplementary only
Ampetronic ILD100	—	—		—	—	
Shokz OpenRun Pro	—			—	—	

*Storm AudioPad Mini lacks integrated speaker and 4-element microphone array; requires companion speaker for full Phase 10 compliance. †Audio output via 3.5mm jack only; requires user-supplied or kiosk-provided headphones. No integrated speaker. ‡EAA-Pad provides navigation and audio output but lacks alphanumeric input, braille display, integrated microphone array, and programmable haptics. Compliant for basic navigation accessibility but requires companion devices for full Phase 10 coverage.

A.5 Procurement Recommendations

For High-Traffic Transit Hubs (Airports, Rail):

- Primary: Storm AudioPad Pro (mounted) + EZY Pad Standard (shelf)
- Secondary: Induction loop (ILD100) embedded in kiosk base
- Backup: Brailliant BI 40X for users preferring dedicated braille

For Retail / Hospitality:

- Primary: Storm AudioPad Pro (mounted) OR ANKER EAA-Pad/ADA-Pad (for compact/space-constrained installations)
- Optional: EZY Pad Standard for high-assistance locations
- Note: Phase 10 compliance recommended but not mandatory until 2028
- **ANKER EAA-Pad/ADA-Pad is ideal for:** Self-checkout, self-service scales, ticketing, and information terminals where only directional navigation is required; cost-effective and compact

For Outdoor / Smart City:

- Primary: Storm AudioPad Pro with IP54 housing
- Required: Anti-microbial coating; saline-resistant contacts
- Recommended: EZY Pad Large (tremor accommodation) with weatherproof cover

For Healthcare:

- Primary: Storm AudioPad Pro + EZY Pad Standard
- Required: Anti-microbial (ISO 22196); disposable headset covers
- Recommended: Brailliant BI 40X for low-vision patients

Document compiled from: DOT Final Rule 78 FR 67882 (Nov 12, 2013); EN 301 549 V1.1.1 (ETSI 2014); ADA 2010 Standards; Section 508 ICT Refresh Final Rule; KMA ADA & Accessibility Committee Code of Practice (2019); KMA Advanced Accessibility Committee — Voice, Tactile & Payment Working Group (2025–2026); Storm Interface Technical Specifications (2024); EZY Technologies Integration Guide (2025).